

Constraints, Restrictions, & Limitations

Number: [ACIS-C-006](#) Type:

<input checked="" type="checkbox"/>	Constraint
<input type="checkbox"/>	Restriction
<input type="checkbox"/>	Limitation

 Original Date: [8/2/95](#)
Revised Date: [1/3/97](#)
Page: 1 of 1

Subsystem:	ACIS
Subject:	ACIS Reconfiguration After Perigee Passage
Source:	Informal CARD inputs, e-mail, M. Juda, 9/11/95

CRL Statement:

[ACIS DEA Sequence Random Access Memory \(SRAM\) and Program Random Access Memory \(PRAM\) should be reloaded after each perigee passage.](#)

CRL Rationale/Justification:

[SRAM/PRAM will be corrupted during each perigee passage.](#)

CRL Impact:

[Damage to ACIS CCDs.](#)

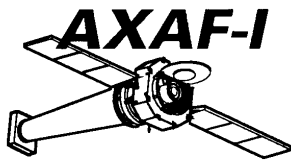
Recommended Action:

[Incorporate into the Systems and Operations Procedures and Mission Planning and Scheduling.](#)

From:
[P. Plucinsky, ASC](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [ACIS-R-005](#) Type:

<input type="checkbox"/>	Constraint
<input checked="" type="checkbox"/>	Restriction
<input type="checkbox"/>	Limitation

 Original Date: [10/12/95](#)
Revised Date: [12/13/96](#)
Page: 1 of 1

Subsystem:	ACIS
Subject:	Contamination
Source:	AVO JAV 96-67.DOC, "Contamination of ACIS Optical Blocking Filter, 3 December 1996, J. Vogrin

CRL Statement:

[The ACIS door is to remain closed for the first 30 days after operational orbit injection.](#)

CRL Rationale/Justification:

[After operational orbit injection, a minimum of 30 days is required to complete outgassing which includes ACIS detector housing and focal plane bakeout. Bakeout avoids the accumulation of unacceptable molecular contamination levels on the Optical Blocking Filter. After bakeout, ACIS can be](#) cooled to its operating temperature for the initial Telescope calibration.

CRL Impact:

[ACIS performance is degraded.](#)

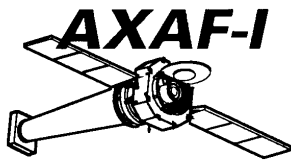
Recommended Action:

Incorporate into the Systems and Operations Procedures, OP16 and OP17.

From:
[L. Ryan](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [CCDM-C-010](#) Type:

x

[Constraint](#)
[Restriction](#)
[Limitation](#)

Original Date: [1/15/97](#)
Revised Date: [1/15/97](#)
Page: 1 of 2

[Subsystem:](#) CCDM
[Subject:](#) EIA Command Rates
[Source:](#)

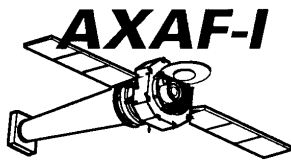
CRL Statement:

- A. [When commanding any slice in the EIA, the maximum continuous command rate for periods of greater than one minute to any one relay shall not energize the relay coil at more than a 10% duty cycle.](#)
- B. [When commanding any slice in the EIA, the maximum continuous command rate for periods of greater than one minute shall not energize the hybrids at more than a 30% duty cycle.](#)

CRL Rationale/Justification:

[EIA design dictates that the slice command rates for periods greater than one minute, as a function of command pulse width and energizing duty cycle, be defined as follows:](#)

EIA Slice	Command Pulse Width, msec	Evenly Spaced Commands/sec	
		30% Duty Cycle, cmds/sec	10% Duty Cycle, cmds/sec
Momentary Command	64	4.6	1.5
Latching Command	32	9.3	3.1
Isovalve	32	9.3	3.1
Isovalve	128	2.3	0.7
Isovalve	256	1.1	0.3
Ordance	32	9.3	3.1



Constraints, Restrictions, & Limitations

Number: CCDM-C-010 Type: ☒ [Constraint](#) Original Date: 1/15/97
☐ [Restriction](#) Revised Date: 1/15/97
☐ [Limitation](#) Page: 2 of 2

[Subsystem:](#) CCDM
[Subject:](#) EIA Command Rates
[Source:](#)

[Slice command rates for periods less than one minute have maximum burst command rates which are as follows:](#)

Command Pulse Width, msec	Number of Evenly Spaced cmds/sec
32	23
64	13
128	7
256	3

CRL Impact:

- A. [Thermal damage to a slice, relay, or hybrid results if the energizing duty cycle exceeds 10% or 30% respectively.](#)
- B. [Commands will be lost if the burst command rates are exceeded.](#)

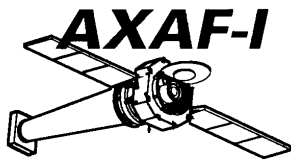
Recommended Action:

Incorporate into the Systems and Operations Procedures and A&T Procedures.

From:
[R. Parr](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [CCDM-L-006](#) Type:

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>

[Constraint](#) Original Date: [1/15/97](#)
[Restriction](#) Revised Date: [1/15/97](#)
[Limitation](#) Page: 1 of 1

Subsystem: CCDM Subject: EIA Serial Command and Telemetry Enable Rate Source:

CRL Statement:

[The maximum serial command rate from the RCTU to the EIA is 1 command every 352 \$\mu\$ sec. The maximum serial telemetry enable rate is 1 telemetry enable every 600 \$\mu\$ sec.](#)

CRL Rationale/Justification:

[EIA design implementation dictates limits to the serial command and serial telemetry enable rates.](#)

CRL Impact:

[Loss of commands and/or telemetry.](#)

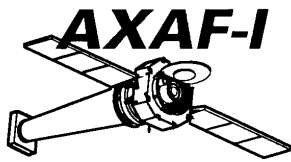
Recommended Action:

Incorporate into the Systems and Operations Procedures and A&T Procedures.

From:
[R. Parr](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [HRC-C-004](#) Type:

x

[Constraint](#) Original Date: [1/30/97](#)
.
[Restriction](#) Revised Date: [1/30/97](#)
[Limitation](#) Page: 1 of 1

Subsystem:	HRC
Subject:	HRC MCP High Voltage Limit
Source:	Informal CARD inputs, e-mail, M. Juda, 1/28/97

CRL Statement:

[HRC high voltages must not be commanded in excess of TBD volts.](#)

CRL Rationale/Justification:

[The HRC sensitivity to high voltage is derived from the HRC design.](#)

CRL Impact:

[Exceeding the allowed voltage will damage the HRC MCP HV.](#)

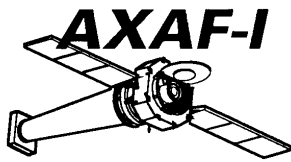
Recommended Action:

[Incorporate into Systems and Operations Procedures.](#)

From:
[M. Juda, ASC](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [HRC-C-005](#) Type:

x

[Constraint](#) Original Date: [1/31/97](#)
.
[Restriction](#) Revised Date: [1/31/97](#)
[Limitation](#) Page: 1 of 1

Subsystem:	HRC
Subject:	HRC Detector Switching
Source:	Informal CARD inputs, e-mail, M. Juda, 1/28/97

CRL Statement:

[HRC high voltages must be commanded off prior to switching from either the Imaging detector to the Spectroscopy detector or the Spectroscopy detector to the Imaging detector.](#)

CRL Rationale/Justification:

[The HRC sensitivity to detector switching is derived from the HRC design.](#)

CRL Impact:

[Detector switching transients will damage the HRC preamplifier inputs.](#)

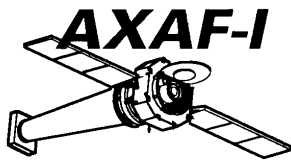
Recommended Action:

[Incorporate into Systems and Operations Procedures.](#)

From:
[M. Juda, ASC](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [HRC-C-006](#) Type:

<input checked="" type="checkbox"/>	Constraint
<input type="checkbox"/>	Restriction
<input type="checkbox"/>	Limitation

 Original Date: [1/31/97](#)
Revised Date: [1/31/97](#)
Page: 1 of 1

Subsystem:	HRC
Subject:	HRC High Voltage and Detector Selection
Source:	Informal CARD inputs, e-mail, M. Juda, 1/28/97

CRL Statement:

[HRC high voltages must not be applied to a detector, i. e., Imaging or Spectroscopy, unless that detector has been selected by the operating electronics.](#)

CRL Rationale/Justification:

[HRC sensitivity to the application of high voltage to detectors is derived from the HRC design.](#)

CRL Impact:

[Inappropriate application of HRC high voltages to a detector will damage the detector grids.](#)

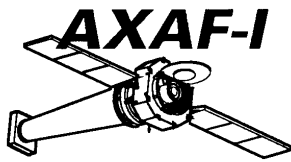
Recommended Action:

[Incorporate into Systems and Operations Procedures.](#)

From:
[M. Juda, ASC](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [HRC-C-007](#) Type:

x

[Constraint](#) Original Date: [1/31/97](#)
.
[Restriction](#) Revised Date: [1/31/97](#)
[Limitation](#) Page: 1 of 1

Subsystem:	HRC
Subject:	HRC High Voltage and Electronic Calibration Mode
Source:	Informal CARD inputs, e-mail, M. Juda, 1/28/97

CRL Statement:

[HRC high voltages must be commanded off prior to turning on the internal electrical calibration mode.](#)

CRL Rationale/Justification:

[HRC sensitivity to high voltage when entering the calibration mode is derived from the HRC design.](#)

CRL Impact:

[HRC high voltage switching transients will damage the HRC preamplifier inputs.](#)

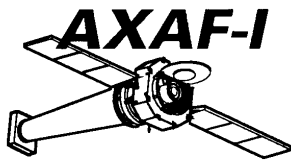
Recommended Action:

[Incorporate into Systems and Operations Procedures.](#)

From:
[M. Juda, ASC](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [PCAD-C-006](#) Type:

<input checked="" type="checkbox"/>	Constraint
<input type="checkbox"/>	Restriction
<input type="checkbox"/>	Limitation

 Original Date: [1/28/97](#)
Revised Date: [1/28/97](#)
Page: 1 of 1

Subsystem:	PCAD
Subject:	VDE Operation During Solar Storms
Source:	

CRL Statement:

[Operation of the Valve Drive Electronics \(VDE\) during significant solar storm activity should be avoided.](#)

CRL Rationale/Justification:

[The VDE is used for momentum unloading via the MUPS thrusters, and for IPS engine control during orbit injection burns. An upset of the VDE during operation due to an SEU is more likely to occur during solar storms by many orders of magnitude depending on the severity of the storm.](#)

CRL Impact:

[An upset of the MUPS burn results in an incorrect momentum unloading, which if long enough, could cause the transfer to Safe Mode. An upset to the IPS burn results in either an incorrect burn duration or an unsequenced burn termination which could cause the failure of the IPS engines.](#)

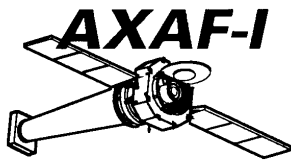
Recommended Action:

[Incorporate into the Systems and Operations Procedures, OFLS Mission Planning and Scheduling.](#)

From:
[R. Rose](#)

Approved:

[M. Yerkes, APM, Mission Operations](#)



Constraints, Restrictions, & Limitations

Number: [PCAD-L-009](#) Type:

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>

 Constraint
Restriction
Limitation
Original Date: [10/15/96](#)
Revised Date: [1/27/97](#)
Page: 1 of 1

Subsystem:	PCAD
Subject:	Search Commands
Source:	EQ7-278 (Section 3.1.2.1.1)

CRL Statement:

[Any tracked image location must be separated by at least 65 arcseconds from all other tracked or monitored image locations.](#)

CRL Rationale/Justification:

[Tracking an image within 65 arcseconds of another image will cause interference with the ACA centroiding algorithm.](#)

CRL Impact:

[ACA search and/or tracked image processing will be corrupted.](#)

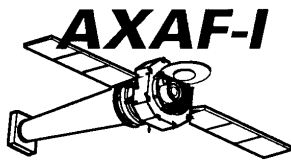
Recommended Action:

Incorporate into the Systems and Operational Procedures.

From:
[D. Sargent](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [PCAD-L-011](#) Type:

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>

[Constraint](#)
[Restriction](#)
[Limitation](#) Original Date: [1/27/97](#)
Revised Date: [1/27/97](#)
Page: 1 of 1

Subsystem:	PCAD
Subject:	ACA Calibration Telemetry Rate
Source:	EQ7-278E (Section 3.1.2.1.4.3)

CRL Statement:

[During ACA calibration, the AXAF telemetry rate must be set to 512 kpbs.](#)

CRL Rationale/Justification:

[This limitation is driven by the ACA design.](#)

CRL Impact:

[The use of any other telemetry rate will result in the loss of calibration data.](#)

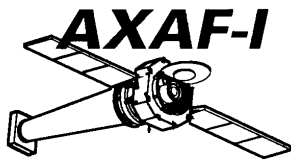
Recommended Action:

[Incorporate into the Systems and Operations Procedures.](#)

From:
[D. Sargent](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: **PCAD-L-013** Type:

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>

[Constraint](#)

[Restriction](#)

[Limitation](#)

Original Date: **1/28/97**

Revised Date: **1/28/97**

Page: **1 of 2**

[Subsystem:](#) PCAD

[Subject:](#) Calibration Command Sequence and Timing

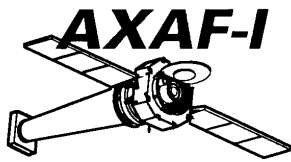
[Source:](#) EQ7-278E (Section 3.1.2.1.4.4)

CRL Statement:

[The ACA calibration sequence is as follows:](#)

- A. [A command must be issued to the IU to begin calibration.](#)
- B. [A command, or sequence of commands, to the ACA must be issued to begin calibration such that the first command to the ACA should be received no earlier than the command to the IU.](#)
- C. [Time, \$T_{wait}\$, will be allowed for all of the commanded calibration data to be clocked out by the IU.](#)
$$T_{wait} = (T_{int} + 1.0) * M + 0.02 * N + 5.0$$

[where \$T_{wait}\$ = waiting time,](#)
[\$T_{int}\$ = integration time,](#)
[M = number of calibration commands issued, and](#)
[N = total number of CCD rows to be read out by](#)
[the M commands,](#)
- D. [Following a delay of least \$T_{wait}\$, a command must be issued to the ACA to stop calibration, and](#)
- E. [A command must be issued to the IU to stop clocking calibration data such that there is at least a 2 second delay between the receipt, by the ACA, of the command to stop calibration and the receipt, by the IU, of the command to stop clocking.](#)



Constraints, Restrictions, & Limitations

Number: PCAD-L-013 Type:

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>

[Constraint](#)

[Restriction](#)

[Limitation](#)

Original Date: 1/28/97

Revised Date: 1/28/97

Page: 2 of 2

Subsystem:	PCAD
Subject:	Calibration Command Sequence and Timing
Source:	EQ7-278E (Section 3.1.2.1.4.4)

CRL Rationale/Justification:

[The calibration command sequence and command timing delay limitation is driven by the ACA design.](#)

CRL Impact:

[Failure to satisfy the calibration command sequence and command timing delays will cause the loss of calibration data.](#)

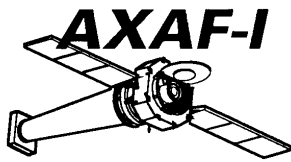
Recommended Action:

[Incorporate into the Systems and Operations Procedures, A&T Procedures.](#)

From:
[D. Sargent](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [PROP-C-001](#) Type:

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

 Constraint
Original Date: [2/23/95](#)
[Revised Date:](#) [1/8/97](#)
Page: 1 of 2

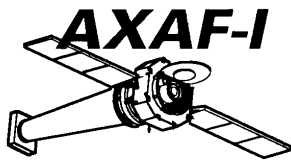
Subsystem:	Propulsion
Subject:	Isolation Valve
Source:	AXAF IPS PDA, 24 August 1994, PS Review, Dec. 8, 1995

CRL Statement:

- A. After the isolation valve is actuated, the enable/disable relay should, [within 20 seconds](#), be opened to disable power being applied to the valve.
[\(Applicable for both ground or flight operations.\)](#)
- B. During storage or other non-flight inoperative periods, PS shall be configured with all latching isolation valves open.
- C. [Following launch, the isolation valve position must be re-established by sending appropriate commands to position the valves as required, i. e., open, irrespective of the launch configuration.](#)

CRL Rationale/Justification:

- A. Application of continuous power to the isolation valve coils [heats the isolation valve coils](#).
- B. [Keeping all latching isolation valves open is the preferred configuration for storage or non-flight periods. The valves should not be closed unless necessary.](#)
- C. [Activation of the PS requires that the isolation valves be open.](#)



Constraints, Restrictions, & Limitations

Number: PROP-C-001

Type:

X

Constraint

Restriction

Limitation

Original Date: 2/23/95

Revised Date: 1/8/97

Page: 2 of 2

Subsystem: Propulsion

Subject: Isolation Valve

Source: AXAF IPS PDA, 24 August 1994, PS Review, Dec. 8, 1995

CRL Impact:

- A. Propellant overheating and/or valve coil damage.
- C. Propulsion system cannot be activated.

Recommended Action:

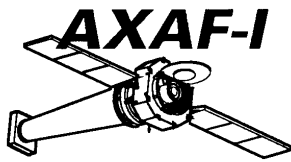
Incorporate into the Systems and Operations Procedures.

From:

N. Mayer

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [PROP-C-003](#) Type:

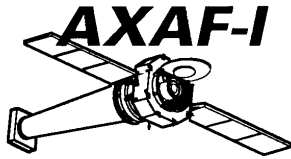
<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

 Constraint
Restriction
Limitation
Original Date: [2/23/95](#)
Revised Date: [10/31/96](#)
Page: 1 of 2

Subsystem:	Propulsion
Subject:	Liquid Apogee Engine - Handling/Processing Constraints
Source:	LAE Handling Literature

CRL Statement:

- A. Protective covers (wrappings) on nozzle exit cone shall only be removed in a clean environment by personnel wearing clean, lint-free gloves.
- B. The valves shall only be electrically actuated per approved test procedures and using a [PS](#)-approved electrical power source designed for this purpose. At no time shall either valve be energized at full power for more than one minute without internal gas or liquid flow (at [PS](#)-approved flow rates).
- C. The nozzle exit cone is very thin and can be readily damaged by moderate contact with other objects. The exterior protective cover for the chamber and exit cone shall be [in place](#) during all operations [and storage](#), except when it must be removed for LAE installation or test purposes.
- D. The disilicide coating on the chamber and nozzle is sensitive to damage by contamination. No labels, bonding, paint, [tape](#), or markings shall be applied to this surface. Only fluids approved by TRW shall contact these surfaces and then only when absolutely necessary. All handling of the LAE shall be done with clean, lint-free gloves.
- E. Only clean, approved fluids ([GHe, GN₂, or leak test gas per MT9-2](#)) shall be flowed through the engine [and only per procedures approved by the PS subproject](#).
- F. The LAE must never be backflowed with any fluid (liquid or gas).
- G. Relative to the LAE head-[end](#), the engine nozzle must always be maintained at or below horizontal position [during Spacecraft acoustic and vibration testing, storage, transportation, and launch](#).



Constraints, Restrictions, & Limitations

Number: PROP-C-003 Type:

x

 Constraint Original Date: 2/23/95
Restriction [Revised Date:](#) 10/31/96
Limitation Page: 2 of 2

Subsystem:	Propulsion
Subject:	Liquid Apogee Engine - Handling/Processing Constraints
Source:	LAE Handling Literature

CRL Statement:

- H. Copper contamination (of Columbium alloy MT2-16-1) may occur at elevated temperatures. Copper or Copper alloys are not to be allowed next to this assembly or its detail parts.
- I. LAE valves are dry cycle limited. Dry cycles must be minimized and recorded in valve cycle logs.

CRL Rationale/Justification:

Lessons learned have shown the these actions protect the LAEs from damage.

CRL Impact:

LAE damage.

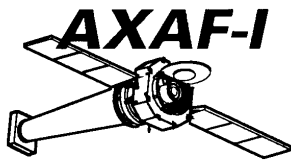
Recommended Action:

Incorporate into Systems and Operations Procedures and A&T Procedures.

From:
N. Mayer

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: **PROP-C-006**

Type:

x

Constraint

Restriction

Limitation

Original Date: **8/18/95**

Revised Date: **10/31/96**

Page: 1 of 2

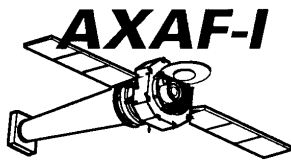
Subsystem:	Propulsion
Subject:	Fiber-Wound Tanks
Source:	AXAF PDA, EQ8-0326, EQ8-0349

CRL Statement:

- A. Propellant and pressurant tanks shall never be stored for a period of more than 24 hours without a GN₂ or GHe blanket pressure of 5-50 psig. This is a concern during backfilling of an electron beam welding chamber, heat treatment or during spacecraft level vacuum testing and storage.
- B. Protective covers are required on overwrapped tanks when exposed and susceptible to damage.
- C. All pressure cycles above 25 psig must be recorded in the pressure cycle log to verify that the total cycle limitation is not exceeded.

CRL Rationale/Justification:

- A. The propellant and pressurant tank assemblies are not designed to withstand external pressure greater than their internal pressure.
- B. Protective covers on overwrapped tanks satisfy safety requirements per the KSC Safety Letter - Ground Hazard Report G14.
- C. The propellant and pressurant tank assemblies are pressure cycle limited.



Constraints, Restrictions, & Limitations

Number: PROP-C-006 Type:

X

Constraint
Restriction
Limitation

Original Date: 8/18/95
Revised Date: 10/31/96 |
Page: 2 of 2

Subsystem: Propulsion
Subject: Fiber-Wound Tanks
Source: AXAF PDA, EQ8-0326, EQ8-0349

CRL Impact:

Tank damage.

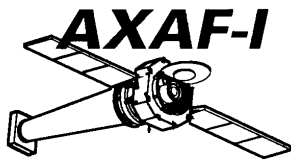
Recommended Action:

Incorporate into A&T Procedures.

From:
N. Mayer

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: **PROP-C-007**

Type:

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Constraint
Restriction
Limitation

Original Date: **8/14/95**

Revised Date: **10/31/96**

Page: 1 of 2

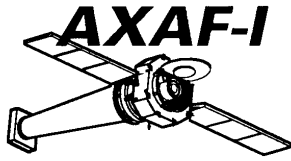
Subsystem:	Propulsion
Subject:	RCS 20-lbf REM
Source:	Kaiser Marquardt

CRL Statement:

- A. Maintain catalyst bed horizontal or below valve at all times during Spacecraft acoustic and vibration testing, transportation, and launch.
- B. Protective covers and caps shall be installed at all times on thrusters when there is no outward flow from the respective units.
- C. Thruster valves shall only be electrically actuated per approved test procedures and using an approved electrical power source designed for this purpose. At no time shall the valve be energized at full power for more than TBD seconds without internal gas or liquid flow (at TRW approved flow rates).
- D. Dry cycles must be limited and all cycles recorded.

CRL Rationale/Justification:

- A. Prevents back-migration of catalyst fines into the injector.
- B. Potential thruster damage is mitigated using protective covers and caps.
- C. TRW approved test procedures mitigate potential overheating the thruster valves.
- D. Thruster valves are dry cycle limited.



Constraints, Restrictions, & Limitations

Number: PROP-C-007 Type:

X

Constraint
Restriction
Limitation

Original Date: 8/14/95
Revised Date: 10/31/96 |
Page: 2 of 2

Subsystem:	Propulsion
Subject:	RCS 20-lbf REM
Source:	Kaiser Marquardt

CRL Impact:

- A. Fuel leakage and/or degraded thruster performance.
- B. Thruster damage.
- C. Thruster valve damage.
- D. Exceeding dry cycle limits potentially damages the thruster valves.

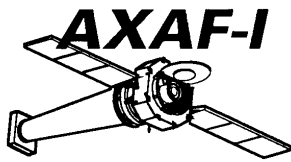
Recommended Action:

Incorporate into A&T Procedures.

From:
N. Mayer

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: **PROP-C-008**

Type:

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Constraint
Restriction
Limitation

Original Date: **8/14/95**

Revised Date: **10/31/96**

Page: 1 of 2

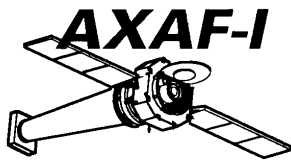
Subsystem:	Propulsion
Subject:	MUPS MRE-0.1 Dual Thrust Module
Source:	TRW

CRL Statement:

- A. Maintain catalyst bed horizontal or below valve at all times during Spacecraft acoustic and vibration testing, transportation, and launch.
- B. Protective covers and caps shall be installed at all times on thrusters when there is no outward flow from the respective units.
- C. Thruster valves shall only be electrically actuated per approved test procedures and using an approved electrical power source designed for this purpose. At no time shall the valve be energized at full power for more than TBD seconds without internal gas or liquid flow (at TRW approved flow rates).
- D. Dry cycles must be limited and all cycles recorded.

CRL Rationale/Justification:

- A. Prevents back-migration of catalyst fines into the injector.
- B. Potential thruster damage is mitigated using protective covers and caps.
- C. TRW approved test procedures mitigate potential overheating the thruster valves.
- D. Thruster valves are dry cycle limited.



Constraints, Restrictions, & Limitations

Number: PROP-C-008 Type:

X

Constraint
Restriction
Limitation

Original Date: 8/14/95

Revised Date: 10/31/96

Page: 2 of 2

Subsystem:	Propulsion
Subject:	MUPS MRE-0.1 Dual Thrust Module
Source:	TRW

CRL Impact:

- A. Fuel leakage and/or degraded thruster performance.
- B. Thruster damage.
- C. Thruster valve damage.
- D. Exceeding dry cycle limits potentially damages the thruster valves.

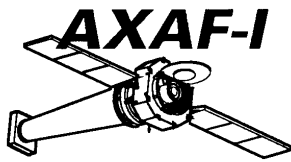
Recommended Action:

Incorporate into A&T Procedures.

From:
N. Mayer

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [PROP-C-010](#) Type:

x

[Constraint](#) Original Date: [10/31/96](#)
.
[Restriction](#) Revised Date: [10/31/96](#)
[Limitation](#) Page: 1 of 1

Subsystem: Propulsion Subject: Pressure Regulator Source:

CRL Statement:

[The pressure regulators must never be back flowed. Any testing involving the pressure regulators requires approval of the Propulsion Subsystem Engineer.](#)

CRL Rationale/Justification:

[The pressure regulators are sensitive to back flow.](#)

CRL Impact:

[Pressure regulator damage.](#)

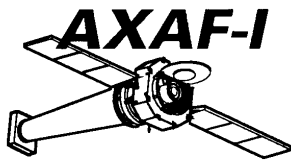
Recommended Action:

[Incorporate into the Systems and Operations Procedures.](#)

From:
[N. Mayer](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: **PROP-C-011**

Type:

X

Constraint

Restriction

Limitation

Original Date: 10/31/96

Revised Date: 10/31/96

Page: 1 of 1

Subsystem: Propulsion
Subject: MUPS Tank
Source:

CRL Statement:

- A. All pressure cycles must be recorded in the pressure cycle log.
- B. The MUPS tank diaphragm must never bottom out on the gas side.

CRL Rationale/Justification:

- A. The MUPS tank is pressure cycled limited.
- B. A positive pressure must always be maintained on the gas side.

CRL Impact:

- A. Exceeding the total cycle limitation may result in tank damage.
- B. Tank and/or diaphragm damage.

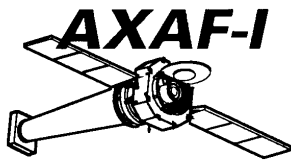
Recommended Action:

Incorporate into the Systems and Operations.

From:
N. Mayer

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [PROP-R-002](#) Type:

<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

 Constraint
Restriction
Limitation
Original Date: [8/11/95](#)
Revised Date: [1/9/97](#)
Page: 1 of 1

Subsystem:	Propulsion
Subject:	Filtration of Liquid/Gases Entering PS
Source:	AXAF PS PDA Package, 24 August 1994

CRL Statement:

- A. Liquid entering the PS shall be filtered to 5.0 microns absolute. Gases shall be filtered to 0.5 micron absolute.
- B. [All gases entering the PS shall have a dryness level of -45.0°F dew point or dryer.](#)

CRL Rationale/Justification:

- A. [This filtration helps protect PS components from contamination.](#)
- B. [This dryness level helps prevent moisture from entering the PS.](#)

CRL Impact:

- A. [PS contamination and performance degradation.](#)
- B. [PS component corrosion and/or leakage.](#)

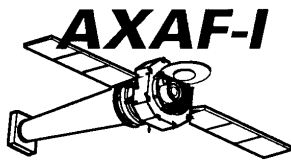
Recommended Action:

Incorporate into A&T Procedures.

From:
[N. Mayer](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: **PROP-R-007** Type:

<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

[Constraint](#)
[Restriction](#)
[Limitation](#) Original Date: **10/31/96**
Revised Date: **10/31/96**
Page: 1 of 1

Subsystem:	Propulsion
Subject:	Subsystem Cleanliness
Source:	

CRL Statement:

Internal flow passages shall only be exposed to a clean room environment meeting class 10,000 of Federal Standard 209. This can be excepted if filters per the filtration of liquid/gases entering PS (PROP-R-002) are installed in a clean room prior to exposing internal flow passages.

CRL Rationale/Justification:

Protection of the internal cleanliness of the PS.

CRL Impact:

LAE component contamination and performance degradation.

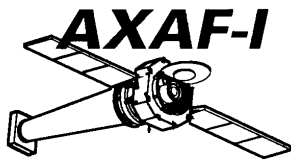
Recommended Action:

Incorporate into the Systems and Operations Procedures.

From:
N. Mayer

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [PROP-R-008](#) Type:

<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

[Constraint](#)
[Restriction](#)
[Limitation](#)

Original Date: [10/31/96](#)

Revised Date: [10/31/96](#)

Page: 1 of 1

Subsystem:	Propulsion
Subject:	Fill and Drain Valve Cycling
Source:	

CRL Statement:

[Slave valves should be installed and utilized for repeated testing.](#)

CRL Rationale/Justification:

[The minimized cycling of the fill and drain valve will avoid exceeding the fill and drain valve cycle requirement.](#)

CRL Impact:

[Fill and drain valve cycle requirements violation.](#)

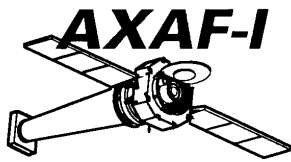
Recommended Action:

[Incorporate into the Systems and Operations Procedures.](#)

From:
[N. Mayer](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: [PROP-R-009](#) Type:

<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

Constraint
Restriction
Limitation

Original Date: [2/23/95](#)

Revised Date: [11/19/96](#)

Page: 1 of 1

Subsystem: Propulsion

Subject: [Liquid Apogee Engine - Firing Constraints](#)

Source: AXAF IPS PDA, 24 August 1994, PS Review, Dec. 8, 1995

CRL Statement:

[The Spacecraft nominal attitude before and after the repositioning for LAE firings is -Z axis pointing to the sun, i. e., -90° pitch, 0° roll.](#)

CRL Rationale/Justification:

[At Spacecraft pitch attitudes less than -75°, direct solar heating of the head-end of the LAE injector will occur. At the worst LAE solar heating case pitch angle of -45°, the injector temperature may exceed 150°F within 2 hours \(without injector heaters powered\). Thus, to ensure compliance with the LAE firing constraint PROP-C-002\(A\) with respect to the maximum allowable temperature, the times at pitch angles less than -75° must be minimized \(<< 2 hours\).](#)

CRL Impact:

[Autonomous termination of LAE burn.](#)

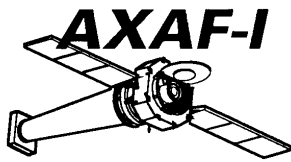
Recommended Action:

[Incorporate into the Systems and Operations Procedures.](#)

From:
[L. Harper](#)

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: **PROP-L-001** Type:

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>

Constraint
Restriction
Limitation

Original Date: **8/11/95**

Revised Date: 1/10/97

Page: 1 of 1

Subsystem:	Propulsion
Subject:	MUPS/RCS Cross Over Pyrovalve
Source:	CARD Input, e-mail, N. Mayer, 8/95

CRL Statement:

Nominal MUPS operations may not be immediately available following the activation of the cross over pyrovalve.

CRL Rationale/Justification:

Upon activation of the cross over pyro valve, GHe may enter the MUPS fuel lines.

CRL Impact:

Pulses will be missed until gas bubbles are purged from the lines.

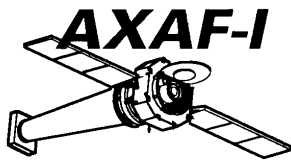
Recommended Action:

Incorporate into Systems and Operations Procedures.

From:
N. Mayer

Approved:

M. Yerkes, APM, Mission Operations



Constraints, Restrictions, & Limitations

Number: **THER-C-003** Type: ☒ Constraint Original Date: **8/28/96**
.
☐ Restriction Revised Date: **10/15/96**
☐ Limitation Page: 1 of 1

Subsystem:	Thermal
Subject:	RF Downlink Prior to Eclipse Entry
Source:	AXAF.96.323.097, RF Downlink Prior to Long-Eclipse Entry Operational Constraint Details, 9 July 1996.

CRL Statement:

The RF downlink must be operating in the high power mode three hours prior to entry into, and during, an eclipse of one hour duration (or greater).

CRL Rationale/Justification:

To minimize eclipse heater power, it is required that the RF downlink (Power Amplifier and Transponder) be activated in high power mode with a modulated signal, i. e., the downlink transmission of telemetry, at least three hours prior to entry into an eclipse of greater than one-hour duration. Activation (fully powered up) must be maintained up to eclipse entry.

CRL Impact:

If RF component heaters operate during eclipse, the batteries may exceed the allowed depth of discharge prior to eclipse exit.

Recommended Action:

Incorporate into Systems and Operations Procedures.

From:
P. Knollenberg

Approved:

M. Yerkes, APM, Mission Operations

52100.500.007
TRW-OP05 23 Oct 96